Hydrogen storage excellence

A new project funded by the DOE Energy Efficiency and Renerwable Energy, Office of Hydrogen, Fuel Cells and Infrastructure Technologies Program forms the new Hydrogen Storage Engineering Center of Excellence. Partners in this center include Pacific Northwest National Laboratory, National Renerwable Energy Laboratory, United Technologies, the Jet Propulsion Laboratory, General Motors, Ford, Lincoln Composites, and the University of Oregon.

The center will address the significant engineering challenges associated with developing low-pressure, materials-based hydrogen storage systems that will enable fuel cell vehicles to meet customer expectations for driving range and performance. Los Alamos presently leads the Chemical Hydrogen Storage Center of Excellence for DOE.

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Graduating class of the 3rd LANL Fuel Cell Short Course

For three days in fall 2008, Los Alamos National Laboratory's Fuel Cell Team hosted 10 scientists and engineers from industry, national labs, government agencies, and universities in the third session of its Fuel Cell Short Course. The intensive workshop included classroom lectures, hands-on lab work, and group assignments.

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Electronic structure of superconductivity refined

A team of physicists, including researchers from the National High Magnetic Field Laboratory's Pulsed Field Facility at Los Alamos, propose a new model that expands on a little understood aspect of the electronic structure in high-temperature superconductors.

The research represents a step toward figuring out the mechanics of superconductivity—the phenomenon that could revolutionize energy efficiency in such areas as mass transportation, electricity transmission, and power storage.

"A multi-component Fermi surface in the vortex state of an underdoped high-Tc superconductor," by a team, which includes scientists from Cambridge University, the University of British Columbia, and Neil Harrison and Charles Mielke, from the NHMFL appears *Nature* **454**, (2008).

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Innovative Materials Physics and Applications

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3D Tracking Microscope

Researchers in the Center for Integrated Nanotechnologies developed the 3D Tracking Microscope, the only confocal microscope capable of following the motion of nanometer-sized objects, such as quantum dots, organic fluorophores, or single green fluorescent proteins, as they move through three-dimensional space at rates faster than many intracellular transport processes.

This enables one to follow individual protein, RNA, or DNA motion throughout the full three-dimensional volume of a cell to see where a particular biomolecule travels, the method it takes to get there, and the specific proteins it may be interacting with along the way.

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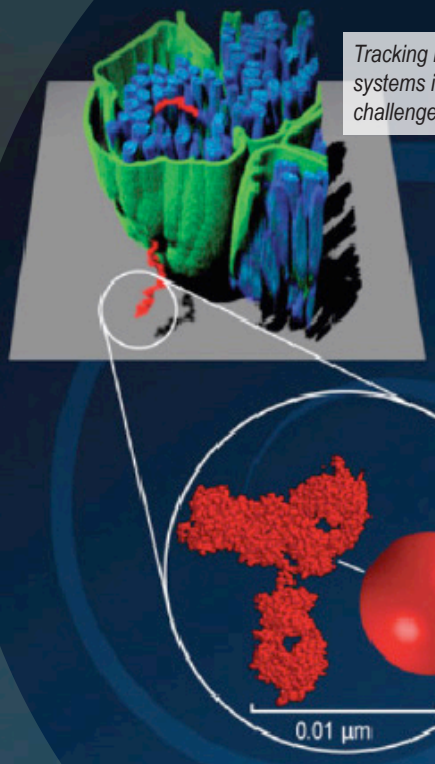

Tracking molecules in living systems is a three-dimensional challenge.

New mechanism for superconductivity

Los Alamos scientists have a new explanation for superconductivity in non-traditional materials—one that describes a potentially new state of matter in which the superconducting material behaves simultaneously as a nonmagnetic material and a magnetic material.

The research, led by Tuson Park and Joe D. Thompson, of the Condensed Matter and Thermal Physics Group (MPA-10) appears in *Nature* **456**, (2008).

In the work, Park and colleagues describe a new mechanism for superconductivity, a different type of "glue" giving rise to superconducting behavior. A new mechanism for the electron-pairing glue that gives rise to superconductivity could allow researchers to design new materials that exhibit superconducting materials at higher temperatures, perhaps even opening the door to the "Holy Grail" of superconducting materials—one that works at room temperature.

The research was supported by the Department of Energy's Office of Science and Office of Basic Energy Science and funded in part by the Laboratory.

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World's first HTS power transmission cable system. The three cables shown entering the ground carry as much power as all the overhead lines at far left.

Collaborating to create next generation power transmission networks

Materials Physics and Applications researchers are collaborating with American Superconductor Corporation (AMSC) to apply AMSC's high-temperature superconductor (HTS) materials expertise to the Laboratory's research initiative in developing HTS-coated conductors for power transmission lines.

High-temperature superconductor-coated conductors offer the promise of replacing copper power transmission lines with superconducting cables that have higher capacity while minimizing resistive cable losses.

The Superconductivity Technology Center (STC) coordinates a multidisciplinary program for research, development, and technology transfer in the area of high-temperature superconductivity. The focus of the STC is on effective collaborations with American industry, universities, and other national laboratories to develop electric power and electronic device applications of high-temperature superconductors.

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